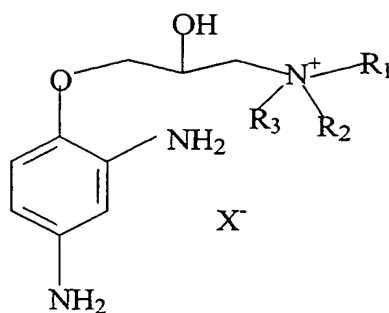


We Claim:

1. A compound of formula (1):



(1)

5 wherein X is selected from the group consisting of Cl, Br, I, or  $\text{R}_4 \text{SO}_4$ ;  $\text{R}_3$  is selected from the group consisting of a  $\text{C}_1$  to  $\text{C}_{22}$  alkyl group or a  $\text{C}_1$  to  $\text{C}_{22}$  mono or dihydroxyalkyl group;  $\text{R}_1$  and  $\text{R}_2$  are each independently selected from a  $\text{C}_1$  to  $\text{C}_4$  alkyl group; and  $\text{R}_4$  selected from the group consisting of a  $\text{C}_1$  to  $\text{C}_{22}$  alkyl group or a  $\text{C}_1$  to  $\text{C}_{22}$  mono or dihydroxyalkyl group.

10 2. A compound of Claim 1 wherein  $\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  are each individually selected from a  $\text{C}_1$  to  $\text{C}_3$  alkyl group.

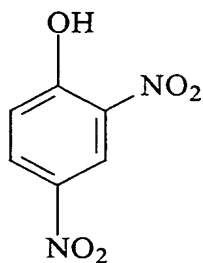
15 3. A compound of Claim 2 wherein each of  $\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  is methyl and X is selected from the group consisting of Cl, Br or methyl sulfate.

4. A compound of Claim 2 wherein each of  $\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  is ethyl and X is selected from the group consisting of Cl, Br or ethyl sulfate.

20 5. A compound of Claim 3 wherein each of  $\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  is propyl and X is selected from the group consisting of Cl, Br or propyl sulfate.

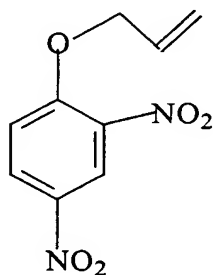
6. A compound of Claim 2 wherein each of  $\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  is hydroxyethyl and X is selected from the group consisting of Cl or Br.

7. A process for the preparation of a compound of formula (1) of Claim 1 comprising (a) reacting an dinitrophenol of the formula (2):



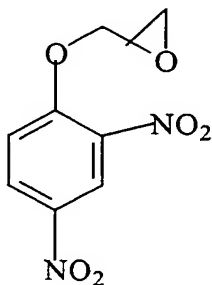
(2)

5 with an allyl halide and potassium carbonate to produce an allyl ether of formula (3):



(3)

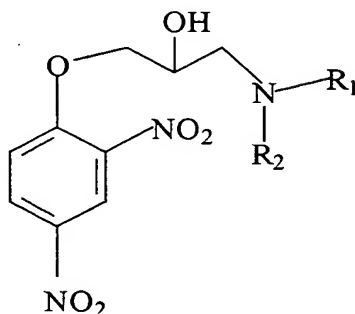
10 (b) epoxidating the allyl ether compound with m-chlorobenzoic acid to produce an epoxide compound of formula (4)



(4)

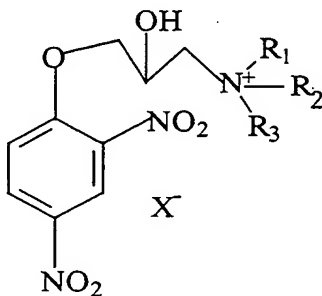
(c) reacting the epoxide compound of formula (4) with a reagent of the formula  $(NR_1R_2)$  to produce a compound of formula (5)

5



(5)

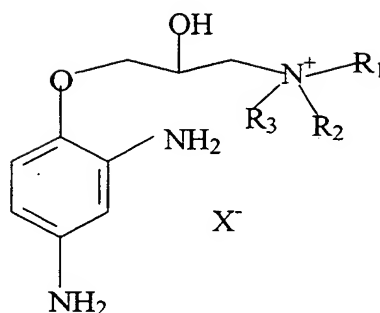
(d) reacting the compound of formula (5) with a quaternization reagent of the formula  $\text{R}_3\text{X}$  to produce a compound of formula (6)



(6)

10

and (e) subjecting the compound of formula (6) to catalytic hydrogenation to produce a compound of formula (1)



(1)

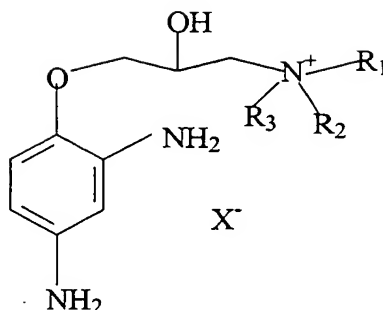
wherein X,  $\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  are as defined in Claim 1.

8. A process according to Claim 7 wherein  $\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  are each individually selected from a  $\text{C}_1$  to  $\text{C}_3$  alkyl group.

9. A process according to Claim 7 wherein each of  $\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  is methyl and X is selected from the group consisting of Cl, Br or methyl sulfate.

10. A process according to Claim 7 wherein each of  $\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  is ethyl and X is selected from the group consisting of Cl, Br or ethyl sulfate.

11. A hair dye product comprising a hair dyeing composition containing at least one primary intermediate and at least one coupler and a developer composition containing one or more oxidizing agents, the hair dyeing composition containing a coupler of formula (1):



wherein X is selected from the group consisting of Cl, Br, I, or  $R_4 SO_4$ ;  $R_3$  is selected from the group consisting of a  $C_1$  to  $C_{22}$  alkyl group or a  $C_1$  to  $C_{22}$  mono or dihydroxyalkyl group;  $R_1$  and  $R_2$  are each independently selected from a  $C_1$  to  $C_4$  alkyl group; and  $R_4$  selected from the group consisting of a  $C_1$  to  $C_{22}$  alkyl group or a  $C_1$  to  $C_{22}$  mono or dihydroxyalkyl group.

12. A hair dye product according to Claim 11 wherein the hair dyeing composition additionally contains a coupler is selected from the group consisting of: benzene-1,3-diol, 4-chlorobenzene-1,3-diol, naphthalen-1-ol, 2-methyl-naphthalen-1-ol, 2-methyl-benzene-1,3-diol, 2-(2,4-diamino-phenoxy)-ethanol, 2-(3-amino-4-methoxy-phenylamino)-ethanol, 2-[2,4-diamino-5-(2-hydroxy-ethoxy)-phenoxy]-ethanol, and 3-(2,4-diamino-phenoxy)-propan-1-ol, 3-amino-phenol, 5-amino-2-methyl-phenol, 5-(2-hydroxy-ethylamino)-2-methyl-phenol, 3-amino-2-methyl-phenol, 3,4-dihydro-2H-1,4-benzoxazin-6-ol, 4-methyl-2-phenyl-2,4-dihydro-3H-pyrazol-3-one, 1H-indol-6-ol, and 2-aminopyridin-3-ol.

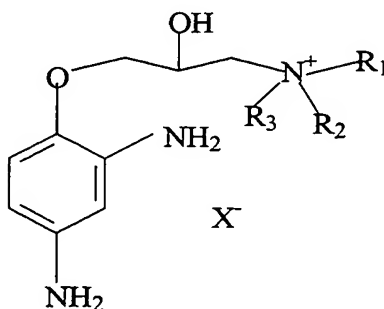
13. A hair dye product according to Claim 11 wherein the primary intermediate is selected from the group consisting of: 2-methyl-benzene-1,4-diamine, benzene-1,4-diamine, 2-(2,5-diamino-phenyl)-ethanol, 1-(2,5-diamino-phenyl)-ethanol, 2-[(4-amino-phenyl)-(2-hydroxy-ethyl)-amino]-ethanol, 4-amino-phenol, 4-methylamino-phenol, 4-amino-3-methyl-phenol, 1-(5-amino-2-hydroxy-phenyl)-ethane-1,2-diol, 2-amino-phenol, 2-amino-5-methyl-phenol, 2-amino-6-methyl-phenol, N-(4-amino-3-

hydroxy-phenyl)-acetamide, pyrimidine-2,4,5,6-tetramine, 2-(4,5-diamino-1H-pyrazol-1-yl)ethanol, 1-(4-methylbenzyl)-1H-pyrazole-4,5-diamine, and 1-(benzyl)-1H-pyrazole-4,5-diamine.

14. A hair dye product according to Claim 13 wherein the hair dyeing composition additionally comprises a coupler selected from the group consisting of: benzene-1,3-diol, 4-chlorobenzene-1,3-diol, naphthalen-1-ol, 2-methyl-naphthalen-1-ol, 2-methylbenzene-1,3-diol, 2-(2,4-diamino-phenoxy)-ethanol, 2-(3-amino-4-methoxyphenylamino)-ethanol, 2-[2,4-diamino-5-(2-hydroxy-ethoxy)-phenoxy]-ethanol, and 3-(2,4-diamino-phenoxy)-propan-1-ol, 3-amino-phenol, 5-amino-2-methyl-phenol, 5-(2-hydroxy-ethylamino)-2-methyl-phenol, 3-amino-2-methyl-phenol, 3,4-dihydro-2H-1,4-benzoxazin-6-ol, 4-methyl-2-phenyl-2,4-dihydro-3H-pyrazol-3-one, 1H-indol-6-ol, and 2-aminopyridin-3-ol.

15. A hair dye product according to Claim 11 wherein  $R_1$ ,  $R_2$  and  $R_3$  are each individually selected from a  $C_1$  to  $C_3$  alkyl group.

16. In a hair dyeing system wherein at least one primary intermediate is reacted with at least one coupler in the presence of an oxidizing agent to produce an oxidative hair dye, the improvement wherein the at least one coupler comprises a compound of the formula (1):

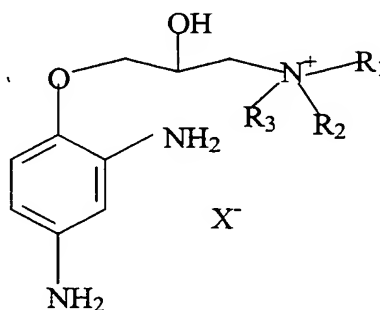


(1)

wherein X is selected from the group consisting of Cl, Br, I, or  $R_4 SO_4$ ;  $R_3$  is selected from the group consisting of a  $C_1$  to  $C_{22}$  alkyl group or a  $C_1$  to  $C_{22}$  mono or dihydroxyalkyl group;  $R_1$  and  $R_2$  are each independently selected from a  $C_1$  to  $C_4$  alkyl group, and  $R_4$  is selected from the group consisting of a  $C_1$  to  $C_{22}$  alkyl group or a  $C_1$  to  $C_{22}$  mono or dihydroxyalkyl group.

17. A hair dyeing composition comprising, in a suitable carrier or vehicle, an effective hair dyeing amount of:

- (a) at least one primary intermediate, and
- (b) at least one coupler comprising a compound of the formula (1):



(i)

wherein X is selected from the group consisting of Cl, Br, I, or  $R_4 SO_4$ ;  $R_3$  is selected from the group consisting of a  $C_1$  to  $C_{22}$  alkyl group or a  $C_1$  to  $C_{22}$  mono or dihydroxyalkyl group;  $R_1$  and  $R_2$  are each independently selected from a  $C_1$  to  $C_4$  alkyl group; and  $R_4$  is selected from the group consisting of a  $C_1$  to  $C_{22}$  alkyl group or a  $C_1$  to  $C_{22}$  mono or dihydroxyalkyl group.

18. A hair dyeing composition according to Claim 17 wherein the hair dyeing composition additionally contains at least one coupler selected from the group consisting of: benzene-1,3-diol, 4-chlorobenzene-1,3-diol, naphthalen-1-ol, 2-methylnaphthalen-1-ol, 2-methyl-benzene-1,3-diol, 2-(2,4-diamino-phenoxy)-ethanol, 2-(3-amino-4-methoxy-phenylamino)-ethanol, 2-[2,4-diamino-5-(2-hydroxy-ethoxy)-phenoxy]-ethanol, and 3-(2,4-diamino-phenoxy)-propan-1-ol, 3-amino-phenol, 5-

amino-2-methyl-phenol, 5-(2-hydroxy-ethylamino)-2-methyl-phenol, 3-amino-2-methyl-phenol, 3,4-dihydro-2H-1,4-benzoxazin-6-ol, 4-methyl-2-phenyl-2,4-dihydro-3H-pyrazol-3-one, 1H-indol-6-ol, and 2-aminopyridin-3-ol.

5 19. A hair dyeing composition according to Claim 17 wherein the at least one primary intermediate is selected from the group consisting of: benzene-1,3-diol, 4-chlorobenzene-1,3-diol, naphthalen-1-ol, 2-methyl-naphthalen-1-ol, 2-methyl-benzene-1,3-diol, 2-(2,4-diamino-phenoxy)-ethanol, 2-(3-amino-4-methoxy-phenylamino)-ethanol, 2-[2,4-diamino-5-(2-hydroxy-ethoxy)-phenoxy]-ethanol, and  
10 3-(2,4-diamino-phenoxy)-propan-1-ol, 3-amino-phenol, 5-amino-2-methyl-phenol, 5-(2-hydroxy-ethylamino)-2-methyl-phenol, 3-amino-2-methyl-phenol, 3,4-dihydro-2H-1,4-benzoxazin-6-ol, 4-methyl-2-phenyl-2,4-dihydro-3H-pyrazol-3-one, 1H-indol-6-ol, and 2-aminopyridin-3-ol.

15 20. A hair dyeing composition according to Claim 18 additionally comprising a coupler selected from the group consisting of: benzene-1,3-diol, 4-chlorobenzene-1,3-diol, naphthalen-1-ol, 2-methyl-naphthalen-1-ol, 2-methyl-benzene-1,3-diol, 2-(2,4-diamino-phenoxy)-ethanol, 2-(3-amino-4-methoxy-phenylamino)-ethanol, 2-[2,4-diamino-5-(2-hydroxy-ethoxy)-phenoxy]-ethanol, and 3-(2,4-diamino-phenoxy)-  
20 propan-1-ol, 3-amino-phenol, 5-amino-2-methyl-phenol, 5-(2-hydroxy-ethylamino)-2-methyl-phenol, 3-amino-2-methyl-phenol, 3,4-dihydro-2H-1,4-benzoxazin-6-ol, 4-methyl-2-phenyl-2,4-dihydro-3H-pyrazol-3-one, 1H-indol-6-ol, and 2-aminopyridin-3-ol.

25 21. A hair dyeing composition of Claim 17 wherein R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each individually selected from a C<sub>1</sub> to C<sub>3</sub> alkyl group.

22. A process for dyeing hair comprising forming a hair dye product composition by mixing a developer composition and a hair dyeing composition as defined in  
30 Claim 17, applying to the hair an amount of the hair dye product composition effective to dye the hair, permitting the hair dye product composition to contact the



23. A process according to Claim 22 wherein R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each individually  
5 selected from a C<sub>1</sub> to C<sub>3</sub> alkyl group.